June 1, 1937. J. P. WALKER 2,082,269

BOLTED TANK

Filed Feb. 21, 1936

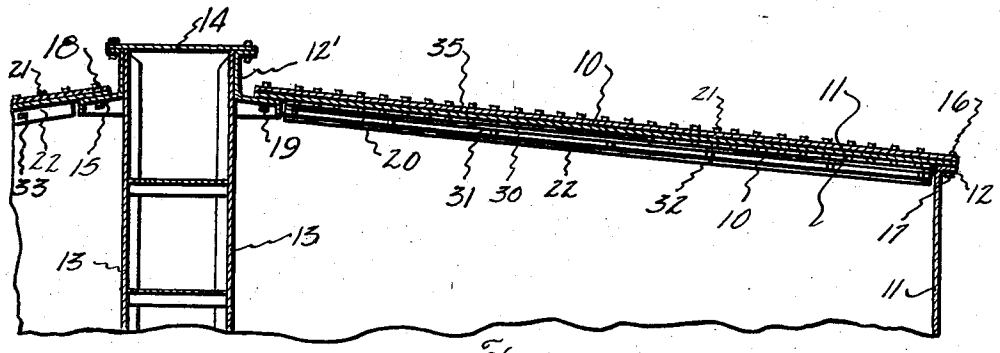


Fig. 1

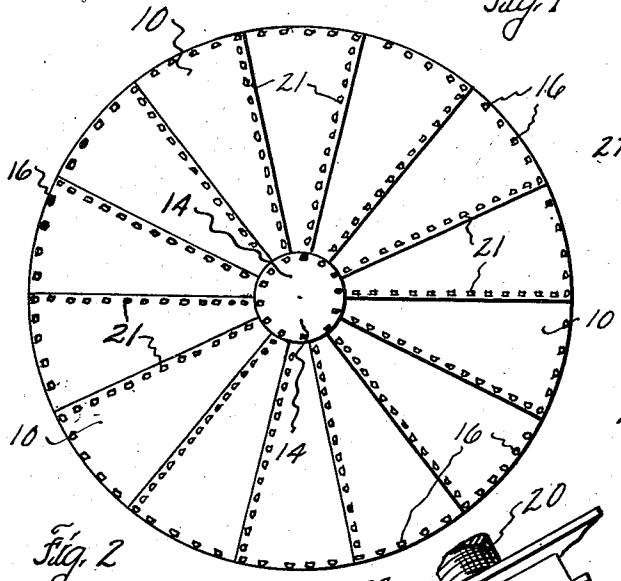


Fig. 2

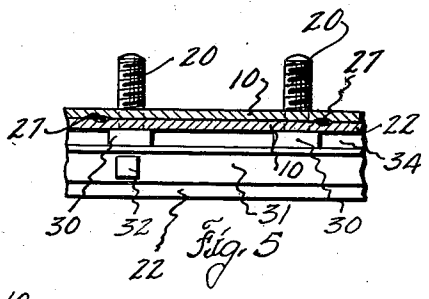


Fig. 5

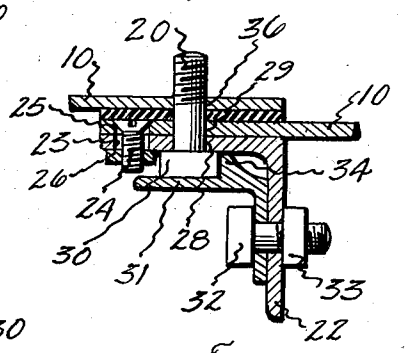


Fig. 3

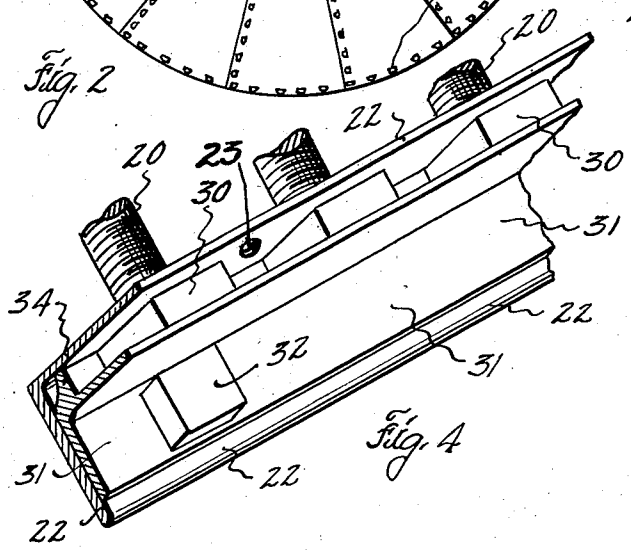


Fig. 4

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BOLTED TANK

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Application February 21, 1936, Serial No. 65,008

12 Claims. (Cl. 108—32)

This invention relates to new and useful improvements in bolted tanks.

One object of the invention is to provide an improved bolted tank joint making for more ready and rapid assembly, stability and general convenience.

A particular object of the invention is to provide improved means for holding the bolts in position when assembling sections of a tank, particularly the roof, and for holding said bolts against rotation when the nuts are secured thereon.

A further object of the invention is to provide a bolt-holding means co-acting with an angle rafter so as to reinforce said rafter, thus permitting the use of a lighter weight rafter.

Still another object of the invention is to provide an improved sheet, rafter, and bolt-holding assembly which enables the placing and bolting of the roof sheets without the use of auxiliary temporary supports.

Another object of the invention is to provide a sheet assembly whereby the angle rafter may be fastened to the sheet and the bolts held in the rafter and sheet against rotation, prior to the mounting of the sheet on the tank.

A further object of the invention is to provide an improved deck or tank seam for bolted metal tanks, which is nonbreathing at the seam because the joint bolts are placed in such a position that the deck supporting means will co-act as a support and a stiffener to prevent movement of the two sheets, which are placed one over the other in such a way as to prevent any movement laterally or longitudinally at the joint when the tank is subjected to pressure or vacuum, or any other means by which the deck may be raised or lowered.

A construction designed to carry out the invention will be hereinafter described, together with the other features of the invention.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawing, in which an example of the invention is shown, and wherein:

Figure 1 is a transverse, vertical sectional view of the upper portion of a tank constructed in accordance with the invention,

Figure 2 is a plan view of a tank roof constructed in accordance with the invention,

Figure 3 is an enlarged, horizontal cross-sectional view of the roof joint,

Figure 4 is a perspective view of a portion of one of the rafters and its bolt assembly, and

Figure 5 is a longitudinal sectional view of another form of sheet and rafter assembly.

In the drawing, the numeral 10 designates one of the sector shaped sheets of which the roof of a metal storage tank is usually formed. It is customary to construct such a tank with an upright wall 11 having an outturned annular flange 12 along its upper edge. A collar or thimble 12' is usually provided in the center and this may be supported by a ladder 13 or any other upright member. Access is usually had to such storage tanks by a thief hatch (not shown) therefore a cover plate 14 is usually bolted across the top of the collar 12' to close the tank. The collar is provided with an annular outwardly extending flange or skirt 15 which may have the same pitch as the roof sheets 10.

In erecting a tank of this character the side wall 11 is set up after the bottom (not shown) has been placed in position. The ladder 13 and the collar 12' are then set up in the middle of the tank and temporarily held in any suitable manner. The first sheet 10 is then placed in position with its upper inner end resting on the skirt 15 and its lower outer end resting on the flange 12. The outer ends of the sheets may be fastened to the flange 12 by bolts 16 and nuts 17 while the inner ends are fastened on the skirt by bolts 18 and nuts 19. The difficult operation is the bolting together of the overlapping side edges of the sheets 10. The bolts 20 are usually passed up through the sheets so that the nuts 21 may be screwed onto the bolts from the outside of the tank.

It has been common practice to place a strip of wood on the ground and insert the bolts from the underside of the sheet so that by picking up the strip and the sheet together the heads of the bolts will be supported by the strip. The strip and sheet are then placed on the flange 12 and skirt 15 which permits the joint to be formed in the usual manner. The strip must then be removed before the bolts 16 and 18 are placed. This is an unsatisfactory method and has many objections. If the strip becomes misplaced the bolts will fall out and further it is desirable to fasten the bolts 16 and 18 in place before completing the seams or joints between the sheets 10. The invention has to do with an arrangement whereby the wooden strip may be omitted and improved means provided for supporting the bolts and at the same time holding them against rotation, it being obvious that the wooden strip will not hold the bolts against rotation. Another end sought is to provide rafters which will

strengthen and support the seams between the sheets, but which will not be excessive in weight. In applying the invention an ordinary angle rafter 22 is employed for each seam. Each rafter is made of such length as to terminate short of the wall 11 and the skirt 15, as is shown in Figure 1. The rafter is disposed with the outer edge of its horizontal leg substantially flush with the edge of the sheet 10 and with its vertical leg offset inwardly, as is shown in Figure 3.

In order to attach the rafter to the underside of the sheet, so that said rafter will be supported when the sheet is placed on the tank, the horizontal leg of the rafter is provided with spaced bolt holes 23 receiving bolts 24. These bolts have their heads countersunk in enlarged holes 25 along the side edge of the sheet 10 and are fastened by nuts 26. Three or four of these bolts will be sufficient to fasten the rafter to the sheet. It is obvious that the rafter could be secured to the sheet in many different ways and in Figure 5 I have shown welds 27 for this purpose. Any suitable means may be used.

The horizontal leg of the rafter is provided with regularly spaced bolt holes 28 in the usual manner and the bolts 20 are passed upwardly therethrough and also through holes 29 in the sheet 10. The heads 30 of the bolts are usually square but could be shaped otherwise so long as they have at least one flat side. The bolts are supported and held against rotation in the rafter by an angle bar 31 which is fastened to the veritcal leg of the rafter 22 by bolts 32 and nuts 33. A few of these bolts are sufficient for the purpose. The bar 31 is provided with an upstanding longitudinal rib 34 which has a flat side exposed to the heads 30 of the bolts 20. If the heads do not contact this rib, they are in such close proximity as to be held against rotation thereby. The bar 31 is subject to variation in shape and while the rib 34 may have a height equal to the thickness of the heads 30, at the same time this is not essential. It is obvious that the bar 31 could be fastened to the vertical leg of the rafter by any suitable means.

The rafter having been fastened to the underside of the sheet 10, the bolts 20 having been placed in position and the bar 31 secured in place, the assembly is then ready to be lifted and placed on top of the tank, as shown in Figure 1. It is customary to lay an elastic packing strip 35 on top of the sheet 10, said strip being punched to receive the bolts 20. When the next sheet 10 is placed it is provided with spaced bolt openings 36 so as to receive the bolts 20 and to rest on the strip 35. The nuts 21 may then be screwed onto the bolts 20, in the usual manner, and the joint or seam is completed. It is pointed out that the angle bar 31 reinforces the rafter and therefore a much lighter rafter may be used because of such reinforcement. It would be possible to place all of the sheets and fasten them with the bolts 16 and 18 before putting any of the nuts 21 on the bolts 20. A roof of this character may be very quickly erected. While I have described the invention as applied to a roof seam, it is to be understood that it may be used on any other seam of a tank of other structure.

What I claim and desire to secure by Letters Patent, is:

1. A joint including, overlapping sheets, an underslung rafter attached to the edge portion of the under sheet, bolts extending through the rafter and sheets and having their heads adjacent the under side of the rafter, and means attached to the under side of the rafter for supporting the bolt heads and having an upstanding projection for holding said bolt heads against rotation.

2. A joint including, overlapping sheets, an underslung rafter attached to the edge portion of the under sheet and angular in cross-section, bolts extending through one leg of the rafter and having their heads adjacent the same, and a bar angular in cross-section disposed in the angle of the rafter and fastened thereto so as to extend longitudinally thereof for supporting the heads of the bolts, said bar having means for holding the heads of the bolts against rotation.

3. A tank structure including, a metal sheet having bolt holes, a rafter having bolt holes registering with the bolt holes of the sheet and extending along one longitudinal edge portion of said sheet, means for fastening the rafter to the sheet, and an elongate member secured to the rafter opposite the bolt holes thereof for supporting bolts in said rafter and sheet and for holding such bolts against rotation when so inserted.

4. A roof rafter including, a rafter member angular in cross-section and provided with spaced bolt holes, and a bar extending longitudinally of the rafter in the angle thereof and having means for holding the heads of bolts inserted in the holes of the rafter against rotation.

5. A roof rafter including, a rafter member angular in cross-section and provided with spaced bolt holes, and a bar angular in cross-section extending longitudinally of the rafter in the angle thereof and attached thereto, said bar having means for holding the heads of bolts inserted in the bolt holes of the rafter against rotation.

6. A roof rafter including, a rafter member angular in cross-section and provided with spaced bolt holes, a bar angular in cross-section extending longitudinally of the rafter in the angle thereof, said bar being secured to one leg of the rafter and spaced from the other leg of said rafter opposite the bolt holes thereof, and a projection extending longitudinally of the bar on the spaced leg thereof and directed toward the rafter for holding bolt heads against rotation.

7. A tank including, an upright annular wall, a central collar, a plurality of roof sheets having their outer edges fastened on the tank wall and their inner ends fastened on the collar, angular rafters secured to the under side of the sheets between the tank wall and the collar, the sheets overlapping above the rafters, means for fastening the rafters to the sheets, bolts extending through the rafters and the sheets at the overlapped portions and having their heads adjacent the under side of the rafters, and means fastened to the rafters for supporting the bolts and holding their heads against rotation.

8. A tank structure including, a metal sheet having bolt holes along one edge portion thereof, an angular rafter fastened to said sheet and having one leg depending and offset from the edge of the sheet, said rafter having bolt holes registering with the bolt holes of the sheet, bolts passing through the holes of the rafter and the sheet and having flat-sided heads, an angular bar disposed in the angle of the rafter and extending longitudinally thereof, a longitudinal

rib on said bar opposite the flat sides of the bolt heads for holding the same against rotation, and means for fastening the depending leg of the bar against the depending leg of the rafter.

9. A joint including, overlapping sheets, an underslung rafter engaging the edge portion of the under sheet, bolts extending through the rafter and sheets and having their heads adjacent the under side of the rafter, and means attached to the under side of the rafter for supporting the bolt heads and having an upstanding projection for holding said bolt heads against rotation.

10. A tank structure including, a metal sheet having bolt holes along one edge portion thereof, an angular rafter engaging said sheet and having one leg depending and offset from the edge of the sheet, said rafter having bolt holes registering with the bolt holes of the sheet, bolts passing through the holes of the rafter and the sheet and having flat-sided heads, an angular bar disposed in the angle of the rafter and extending longitudinally thereof, a longitudinal rib on said bar opposite the flat sides of the bolt heads for holding the same against rotation, means for fastening the depending leg of the bar against the depending leg of the rafter, and means for fastening the sheet to the rafter.

11. A joint including, overlapping sheets, an underslung angular rafter having its horizontal leg disposed along the underside of the edge portion of one of the sheets and its vertical leg offset inwardly from the edge of said sheet, whereby said sheet and rafter are unobstructed, means for fastening the edge portions of the sheet and rafter together, bolts extending through the sheets and rafter, and means carried by the rafter for supporting the heads of the bolts, whereby the bolts may be assembled in the rafter and supported while the rafter is being applied to the sheets, said means also including an integral element for holding the bolt heads against rotation.

12. A rafter for a bolted joint including, an angular member including a horizontal leg having spaced bolt holes and a vertical leg, a plurality of inverted bolts extending through the holes of the horizontal leg of the rafter and having angular heads disposed immediately under the horizontal leg, and a retaining member mounted in the angle of the angular member and secured thereto, whereby the bolt heads are supported and the bolts are held in said angular member, the retaining member having an additional element for holding the bolt heads against rotation.

JAY P. WALKER.